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An Osteoporosis Risk Assessment Workshop for Advanced Practice Nurses

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Abstract

Osteoporosis is noted as one of the foremost causes of disability and morbidity worldwide (Rapp et al., 2016). An osteoporotic fracture can result in significant debility, resulting in significant financial burdens. Screening guidelines for osteoporosis are in place, but confounding variables often lead to missed screening and treatment opportunities. Xu, Lombardi, Jiao, and Banfi (2016) state that bone health is essential for maintaining quality of life and overall health and that one out of two Caucasian women will suffer an osteoporotic-related fracture in her lifetime. Current research supports identifying those at risk, screening, and potentially implementing pharmacological treatment regimens to increase bone density once osteoporosis is diagnosed. Numerous screening instruments are available to identify those at risk, but many women are under-screened for this potentially debilitating disease. The purpose of this Doctor of Nursing Practice (DNP) translational project is to determine if the implementation of an osteoporotic fracture prevention workshop for Advanced Practice Registered Nurses (APRNs) impacts screening practice patterns for perimenopausal female patients.

Keywords: Osteoporosis, osteoporosis screenings, fragility fracture, bone density

Implementation of an Osteoporosis Workshop for APRN's to Identify Female Patients at Risk for Low Bone Mass

Osteoporosis is a bone disease characterized by low bone mass and deterioration of skeletal bone tissue which often results in increased bone fragility and fracture (Black, Reid, & Sandison, 2009). It is a common skeletal condition that is prevalent amongst postmenopausal females when estrogen storage and production drops significantly. It is often referred to as the silent disease and not detected until an osteoporotic fracture occurs, often preceded by a fall. These fragility fractures are one of the leading causes of disability for the older population (Rapp et al., 2016). A fragility fracture increases the risk of a subsequent fracture by 50% (Mendis, Ganda, & Seibel, 2017). Age related bodily changes often affect numerous bodily systems which includes decrease in sensory perception, decreased body mass, changes in visual acuity, and neuro related conditions causing imbalance. Low bone mass (osteopenia or osteoporosis), decreased vision acuity, and falls can perpetrate fractures that increase morbidity and mortality. The impact of osteoporosis affects 200 million women worldwide with over nine million fractures per year in the United States (Keshishian et al., 2017). The impact of direct medical costs following a fragility fracture is estimated at $17 billion in Canada (Weng, Hess, Lynn, & Litner, 2015) and $20 billion in the United States (U.S.) per year (Shuler, Scott, Wilson-Byrne, Morgan, & Olajide, 2016). Xu et al. (2016) state the likelihood of a woman experiencing an osteoporotic-related fracture in her lifetime is one out of two women. It is estimated that 10%-20% of hip fracture patients die within the first year after the related fall/injury and risk of premature death is elevated for at least 10 years (Gillespie & Morin, 2016). The impact, burden, rehabilitation, and costs associated with these fractures are significant and often result in permanent residence in an assisted living or skilled care living institution. The prevalence of

osteoporosis is expected to climb as our population increases and ages. Evidence-based guidelines for low bone mass screening and treatment are readily available, however research reveals that osteoporosis remains under-diagnosed, under-screened, and under-treated, especially in the non-Caucasian population (Golob & Laya, 2015).

Evidence-based screening tools are noted to be one of the most beneficial and reliable ways to diagnose those at risk not only for osteoporosis but for current low bone mass and density. However, it is estimated that millions of women are under screened for this serious disease and providers lack consistency with their screening protocols. This translational project seeks to explore if the implementation of an osteoporotic fracture prevention workshop will impact and/or change pre-screening patterns by APRN's for their female patients ages 45-64.

Background

Bone balance is determined by the activity of osteoclasts (break down bone tissue) and osteoblasts (build new bone tissue). Well known major risk factors for the development of osteoporosis include: female gender, advancing age, and estrogen deficiency. There are many other risks that increase one's risk for bone loss. Behavioral risks include: excess alcohol intake, inadequate calcium and Vitamin D intake, tobacco abuse, lack of exercise, and diet (Golob & Laya, 2015). Other risks include demographic factors such as race, height and body habitus, and medical conditions such as rheumatoid arthritis, hypogonadal disorders, and hyperparathyroidism. Medications, such as glucocorticoids, are attributed with significant risk for bone loss especially during the first few months of use (Golob & Laya, 2015).

Prevention is a vital component in identifying those at risk or deemed a future risk for an osteoporotic fracture. Recent studies identified by Xu et al. (2016) have shown that screening rates for Medicare age women are as low as 30-48% over a seven-year time frame. The United

States Preventive Services Task Force (USPSTF) has recommended universal osteoporosis screening for women 65 years and older (at 2-year intervals), and targeted screenings for younger women with identified risk factors (United States Preventive Services Task Force, 2018) with a dual energy x-ray absorptiometry scan (DXA). Other reputable guidelines exist for the U.S. and include those of the National Osteoporosis Foundation (NOF) (Siris et al., 2014) and World Health Organization (WHO) (World Health Organization-4bonehealth, n.d.). In 2008 newer WHO screening guidelines were established based on fracture risk and served as a model for lowering the risk with use of osteoporosis medicines. The new guidelines for treatment are for postmenopausal women, any ethnicity or race, and for men age 50 and over (World Health Organization-4bonehealth, n.d.). Three categories were specified as high risk groups and met the Food and Drug Administration (FDA) criteria for FDA approved drug implementation. The three groups include those with (1) a history of fracture of the hip or spine (2) those with a bone mineral density (BMD) in the osteoporosis range (T-score of -2.5 or lower), and (3) those with a BMD in the low bone mass or osteopenia range with a higher risk of fracture defined by the fracture risk assessment tool (FRAX) score for a major osteoporotic fracture 10-year probability of 20% or higher or a hip fracture 10-year probability 3% or higher.

APRNs play a vital role in the prevention and screening aspect of healthcare. Patients often choose to see an APRN to provide comprehensive primary care which includes preventative counseling and recommended screenings. Once osteoporosis is diagnosed by a provider, bone mass loss can often be reversed by diet, exercise, vitamin supplementation, and pharmacologic therapy. However, studies indicate low screening rates for women ages 50 and greater in the U.S. from 2008-2014 (Gillespie & Morin, 2016) with screening among women ages 50-64 years dropping steadily. Gillespie and Morin (2016) state that recent studies indicate

screening rates state that recent studies indicate screening rates were low with the average screening rate for women ages 50-64 only 21.1% and 26.5% for ages 65-79.

Problem Statement

Prevention of osteoporosis should be of prudent concern for health care providers because most women are not screened routinely. The goal of osteoporosis screening is to identify those women at increased risk of low bone mass and possible future fracture who would benefit from an intervention such as medication administration to decrease that risk (Jiang et al., 2016). Numerous non-radiologic risk assessment tools exist for screenings such as the FRAX Tool which uses multiple risk factors that can be used with or without a BMD to predict the 10-year probability of a hip fracture or other major osteoporotic fractures (Chen et al., 2016). The Simple Calculated Risk Estimation tool (SCORE) (Appendix A) is based on race, age, weight, previous fracture, history of autoimmune disease and use of estrogen therapy (University of Washington-Osteo ED, n.d.). This non-invasive and non-radiologic screening tool can play a key role in identifying those younger individuals at risk for low bone mass. Recent data indicates that less than one in four privately insured women (65+ years) are screened for primary prevention by their healthcare provider (Gillespie & Morin, 2016) and younger women, less than 65 with known risk factors, are not screened until well after a fracture occurs. Numerous FDA approved osteoporotic drugs are available and have been shown to reduce the risk of fractures by 20-50% (Elders et al., 2017). Inconsistent screenings can lead to potentially disabling fractures, undue pain, rehabilitation, significant medical bills, relocation to assisted living or skilled living facilities, increased mortality, and possible mortality (Black, Reid, & Sandison, 2009). Coordination of care and screenings are often managed between numerous providers and specialists which unintentionally creates a gap that assumes screenings are being managed by

others. There are numerous barriers that exist in implementing these guidelines which include knowledge, time, insurance challenges, and financial barriers. A recent interview with Debby Godwin, a nurse practitioner (NP) in a family practice setting, illustrated her confusion with osteoporosis screenings (D. Godwin, personal communication, October 12, 2018). She reflected she should be utilizing the screening tools more efficiently but time restraints in a busy setting often negate the tool being used. Debbie also stated that denials for DXA scans were a great concern for females under age 65 and are often not covered by the insurance companies-so females often lack screenings.

Needs Assessment

Gillespie and Moran (2017) state that screening rates for osteoporosis in women between the ages of 55 and 64 decreased by 44% and non-Hispanic women were least likely to be screened. This study concluded only 21% of women (age 55-64) were screened for osteoporosis and screening rates were low for women >65 years of age. The USPSTF has specific guidelines in place stating osteoporosis screening should begin at age 65 or for those with identifiable risk factors. Mortality rates post hip fracture are 20-25% (Rapp et al., 2016) within the first year with 50-60% having some permanent disability. However, numerous gaps have been identified in guideline screenings and current practice patterns. Jiang et al. (2015) state that there is no consensus as to which menopausal or early menopausal women should have screening done via DXA. Often the provider is unaware as to who will manage osteoporosis screenings if a patient sees multiple providers or specialists. Other barriers to screening include lack of screening tools available, insurance, time constraints with patients, and limited availability of resources for those without funds. Rural health clinics face other barriers including lack of access to DXA imaging

and bone density testing. Consistent and preventative screenings are a must to catch those at risk now or deemed a future risk of fragility fracture.

A pre-project needs assessment was explored targeting advanced practice nurse practitioners of the Cobb/Cherokee United Advanced Registered Nurse (UAPRN) chapter. The needs assessment was created and delivered by the PI in a survey format. It asked specific questions regarding (1) awareness of current USPSTF guidelines regarding osteoporotic screenings and (2) the need for an osteoporosis risk assessment workshop. Results from the survey indicated 33.33% of the total participants (n = 24) were not aware of current screening guidelines and 83.33% indicated a need for an osteoporosis risk assessment workshop.

This paper will describe the components of a comprehensive needs assessment that was completed as well as the underlying rationale for choosing the topic for this scholarly research project. Prevention is a key component in identifying those at risk or deemed a future risk for an osteoporotic fracture. The needs assessment focused on osteoporosis fracture prevention as a phenomenon of interest. Practicing APRNs were identified due to their authorized ability to perform screenings and order additional imaging if warranted. The specific areas of interest included knowledge of current osteoporosis screening guidelines, utilization of additional screening tools, and practice patterns for those at risk for osteoporosis related fractures.

Objectives and Aims

The purpose of this DNP translational project was to determine if the implementation of an osteoporotic workshop impacts the screening patterns of APRNs. Knowing in advance that screening rates are low for all women, the aim of the project was to empower these providers with tools that will identify those at risk or a future risk of either osteoporosis or a fragility fracture. The prevention program included an educational workshop, introduction of

supplemental screening tools per the World Health Organization (WHO), National Institute of Health (NIH), and the United States Preventive Services Task Force (/USPSTF) guidelines and recommendations, interpretation of BMD imaging, and advanced alternative to radiologic imaging devices such as ultrasound scanning.

Rural health clinics face other barriers including lack of access to DXA imaging and bone density testing. The implementation of fall prevention programs is standard in assisted living facilities, skilled nursing homes, and community centers but rare is a program that combines a fall and osteoporosis prevention program (Mendis et al., 2017). The utilization of non-radiologic imaging tools could be a vital key in identifying those at high-risk for problems. Although screening recommendations exist, application and use are a valid problem. The clinical practice questions this project aims to answer are:

1. Will APRN's who attend an osteoporosis risk assessment program implement the SCORE tool into practice?
2. Will the EBPQ tool identify APRN's who will implement change into practice?
3. What work/environmental factors are associated with the implementation of the SCORE tool into practice?
4. What are the perceived barriers that prevent implementation of the SCORE tool into practice?

Review of Literature

Osteoporosis is a major health problem and concern that affects people not only nationally but globally as well. As the U.S. population ages, so does the prediction in the increase of osteoporosis. Although evidenced based guidelines are in place to help with screening and treatment, osteoporosis remains underdiagnosed, undertreated, and under screened

(Golob & Laya, 2015). Literature is consistent that osteoporosis remains one of the most debilitating and chronic diseases amongst postmenopausal females with increasing risk of fractures after age 50 (Kling, Clarks, & Sandhu, 2014). The USPSTS warrants there is resounding evidence that bone mineral and measurement tests are accurate in diagnosis and predicting low bone mass and osteoporosis (USPSTF, 2018).

The literature is consistent that osteoporotic fractures are associated with increased morbidity and mortality for numerous years after a fracture (Gillespie & Morin, 2016). There is also decreased quality of life, substantial medical costs, and a leading cause for disability (Rapp et al., 2016). Mendis et al. (2017) concluded that as many as 70%-80% of patients with an osteoporotic fracture are not being adequately screened, diagnosed, or treated. Patients with low bone mass are at high risk for current and potential future fragility fractures that will only be diagnosed after a fracture occurs (Keshishian et al., 2017). It is estimated that total costs related to osteoporosis in the US are more than $19 billion dollars and the costs are expected to rise by almost 50% by 2025 (Shuler et al, 2006). Health education and health promoting lifestyle behaviors can impact bone health. Exercise, adequate calcium intake, healthy diet, and vitamin D supplementation are all strategic influences that can positively impact bone mass. Genetics and a family history of osteoporosis can also impact bone mass in a negative way. Research promotes prompt evaluation, screening, and treatment of osteoporosis and is indicated to prevent further fracture-related conditions as well as morbidity and mortality.

The extent to which providers follow the USPSTF guidelines in screening, specifically Medicare age females, is unclear but studies conclude screening rates between 30-48% (Amarnath, Franks, Robbins, Xing, & Fenton, 2015). Rural areas face other challenges and DXA imaging is negatively impacted with a 20% drop in osteoporosis screening rates when a DXA is

located greater than 5 miles from the patient (Shuler et al., 2016). There is inconsistent universal consensus as to when to begin screenings as stated by Golob and Laya (2015). The FRAX tool is one of the most popular yet underused tools in identifying those at risk. Conflicting decisions occur when providers suspect a patient could be at risk yet hesitant to screen due to unnecessary costs and imaging.

Numerous non-imaging tools have been used by clinicians for decades with accurate specificity in results as compared to BMD imaging. The results of a phone survey on rural West Virginia females, 65years and greater, confirmed that the FRAX phone survey is as reliable as DXA in detecting osteoporosis or osteopenia but fails to identify women younger than 65 at risk (Shuler et al., 2016). Despite available current guidelines, research states less than 25% of women 65 years and older underwent bone mass screening from 2008 to 2014 (Gillespie & Morin, 2016). Findings are reliable that there are inconsistencies related to when to screen for osteoporosis in females, often leading to missed opportunities for treatment to prevent further bone loss.

Risk Factors

Bone mineral density is associated with several factors such as age, menopause status, weight, body mass index (BMI), and socio-economic class (Haryono & Prastowo, 2017). Postmenopausal females are much higher risk than their male age equivalent counterparts. Kling et al. (2014) notes that the lifetime risk of any osteoporotic fracture is 40%-50% for women and 13%-22% for men which is considerably higher than other major diseases. Risk factors include family history of osteoporosis, advancing age, female gender, smoking, excessive alcohol use, lack of exercise, a diet low in calcium and vitamin D, thin frame or below normal body mass index, hyperthyroidism and hyperparathyroidism, glucocorticoid use, premature menopause,

post-menopausal state (estrogen deficiency), excessive dieting or eating disorders, and being of European or Asian descent. The use of daily dose glucocorticoids as low as 2.5mg to 7.5mg can significantly decrease bone density and most noted in the first few months of use (Golob & Laya, 2015). They also note that most osteoporotic hip fractures occur due to falls and it is imperative to assess environmental factors that may contribute to falls such as hazards in the home, impaired balance and decreased proprioception, and medical conditions such as hypotension which can cause significant dizziness and balance issues.

Mortality

Currently, there are over two million osteoporotic related fractures in the United States annually with rates expected to increase to three million by 2025 (Gold et al, 2019). Fifty percent of U.S. women will experience an osteoporosis-related fracture in her lifetime with hip fractures being the leading cause of long-term nursing home care (Kling et al., 2014). In the Swedish SENIORLAB study, osteoporosis was found to be the most important risk factor for all causes of mortality in a relatively healthy population of persons ages 60-99 (Gutzweller, 2018). Findings of this study state that a clinical diagnosis of osteoporosis had a higher relative risk for mortality than diabetes type 2 and hypertension.

Literature is consistent that there is worldwide under-screening and under-treatment for osteoporosis. Low bone mass, left undetected, can lead to burdensome fractures and decreased quality of life. Mortality rates for hip fractures can be as high as 45% one-year post fracture. The USPSTF estimates that by the year 2020, 12.3 million individuals in the U.S are expected to have osteoporosis (USPSTF, 2018). The overall impact related to these fractures is often difficult for a person or family to manage.

Costs

The burdens and costs related to osteoporosis are seen globally. It has become a major U.S. health problem affecting millions of adults >50. Falls, fractures, increased morbidity and mortality, hospitalizations, lost days of productivity, depression, and decreased quality of life are some of the most impactful consequences related to osteoporosis. It is often called the silent disease until a fracture occurs and thus causing significant impact on the quality of daily living and life. The yearly cost of osteoporotic fractures is approximately $2 billion and expected to increase with our aging population (Daroszewska, 2015). The majority of these costs are related to hip fractures and their high mortality and morbidity rates. The costs and annual fracture rates associated with osteoporosis are estimated to rise by 50% by the year 2025 (Kling et al., 2014).

Osteoporosis is one of the foremost causes of disability and morbidity worldwide in older adults (Rapp et at., 2016). Individuals are often left with chronic pain and disability due to these fragility fractures. The loss of independence associated with fractures often leads to depression, isolation, altered daily engagement activities, and social withdrawal. Only 50% of hip fracture patients regain their functional status after the fracture (Tsai, 2019).

There are often socioeconomic factors related to the prevalence of osteoporosis as seen in non-citizens of the U.S. and the less educated. Osteoporosis is also more prevalent in those who are unemployed and with lower incomes. Individuals who rely on social security as their primary source of income often become food insecure and make poor food choices due to lack of income (Black et al., 2009). The soaring medical costs related to fracture care can leave an individual without adequate resources for a healthy diet and lifestyle. Post fracture care can leave an individual with little financial resources to live on. Difficult choices often must be made for long-term care or assisted living arrangements.

Tools

The goal of osteoporosis screening is to identify individuals who are at increased risk for low bone mass and would benefit from an intervention to decrease the risk. For the purpose of this project "tools" will include the non-radiologic risk assessment tools/instruments that can be done by either the provider or the patient. Primary osteoporosis (without underlying disease) increases with age and impacts different races/ethnicities differently. The USPSTF found there is adequate evidence that risk assessment tools are moderately accurate in identifying a person's risk of osteoporosis (USPSTF, 2018).

Numerous risk assessment tools have been validated and proven effective in identifying younger women who are at risk for low bone mass and at risk for the development of osteoporosis (Golob & Laya, 2015). During the last several decades newer screening tools have been acknowledged and currently replace the DXA as a first step screening process in the younger population to reduce unnecessary radiation exposure and the burdensome costs associated with DXA. Three of the most validated screening tools include SCORE, OST (osteoporosis self-assessment tool), and ORAI (osteoporosis risk assessment instrument). These tools aim at identifying persons with low bone mass who should be further sent for diagnostic imaging. BenSedrine et al. (2000) state that screening whole populations is unreasonable and not necessary. The study by BenSedrine et al. (2000) on women 45 years and older *(n* = 4,035) concluded that the SCORE tool could be used with qualified confidence to exclude patients who should not be imaged for low bone mass. Jiang et al. (2016) explain that early DXA screening and when to initiate is confusing for providers and evidence is lacking. In his study the SCORE tool had the highest sensitivity (92%) in predicting women who were diagnosed with osteoporosis with DXA. In another study of 211 female patients ages 45-88 years (average age

57), the SCORE tool had the highest sensitivity (95.2%) in identifying women with low bone mass after sent for imaging (Ahmadzadeh, Emam, Rajael, Moslemizadeh, & Jalessi, 2013). Data from 1,279 postmenopausal women were analyzed in a study by Lydick et al. (1998) and indicated the SCORE prescreening tool could decrease radiologic DXA imaging by 30%. The newest recommendation is to prescreen women younger than age 65 by using one of clinical risk assessment tools such as FRAX, OST, and SCORE (Cauley, 2018).

One of the most widely used tools is the FRAX tool-which estimates a 10-year probability of either a hip fracture or other major osteoporotic fracture with or without a BMD score. There are more than 30 different risk factors listed on various screening guidelines. A FRAX score of 20% or higher for a major osteoporotic fracture or a 3% or greater score for a hip fracture warrants screening with the DXA scan. Golob and Laya (2015) state that some authors have found that there are other tools more sensitive than FRAX in identifying women with low bone mass.

DXA scan

Dual-energy X-ray absorptiometry, DXA scan, is the noted gold standard and premium method for identifying a patient with osteoporosis (Gillespie & Morin, 2016). It is the preferred method in diagnosing osteoporosis and observing T- scores after the implementation of osteoporosis medications. The current USPSTF guidelines recommend screening for osteoporosis in women 65 years and older as well as women less than 65 years who are at increased risk of osteoporosis as determined by some type of a clinical risk assessment tool (USPSTF, 2018) when guidelines were updated at that time. However, there is no consensus on when to initiate a DXA screening for early post-menopausal women less than 65 years of age. Jiang (2016) stated in a recent major study comparing various risk assessment tools that in using

the USPSTF guidelines only 24% of the women with osteoporosis would need a DXA compared with 92% using the SCORE tool.

The Choosing Wisely Initiative is a campaign founded by the American Board of Internal Medication (ABIM) which aims to decrease unnecessary tests, medical procedures and treatments. (Amarnath, Franks, Robbins, Xing, & Fenton, 2015). It does support DXA imaging in female patients younger than 65 with known, identifiable osteoporosis risk factors. In a survey reported by (Amarnath et al., 2015), over 40% of women who were referred for a DXA did not meet guidelines for imaging.

Education of Providers

It is imperative that healthcare providers are familiar with the USPSTF and other healthcare screening guidelines. As newer evidence from data is analyzed, healthcare practice changes must follow. Amrarnath et al. (2015) evaluated different screening rates amongst a regional healthcare system and reported that their analysis revealed misuse and overuse of DXA screening for women at low risk for osteoporosis. A significant barrier is that clinicians and providers received little support from the electronic medical record (EMR) system with regards to decision making on the optimal use/ordering of a DXA. Although many older patients are sent reminder letters to alert them when a DXA screening is due, many providers lack the decision-making support when a younger female patient might need to be screened due to risk factors.

The two most primary mechanisms of fragility fractures are osteoporosis and falls (Rapp et al., 2016). Many rural areas lack availability for fall prevention programs. Once osteoporosis is detected, it is the responsibility of the healthcare team to explore optional methods to reduce future fragility fracture risk. It requires the coordination of care between numerous team members to offer a supportive approach and program plan. Exercise is one of the most effective

fall prevention strategies and also improves balance, muscle mass and strength, as well as bone strength, yet research shows that evidence is lacking on bone strength and aerobic exercise programs (Yoo, Jun, & Hawkins, 2010).

Medication

The use of anti-osteoporosis (AOM) drugs have shown to maintain and even increase bone density (Balaji, 2016). Several known classes of medications are currently used to treat or prevent osteoporosis: bisphosphonates, monoclonal antibodies, hormone therapy, synthetic parathyroid hormone, and Selective Estrogen Receptor Modulators (SERM). Bisphosphonates and monoclonal antibody medication work by interfering with the breakdown of bone composition by the osteoclasts. SERM's and estrogen medication block osteoclast activity but to a lesser degree. Synthetic parathyroid medications increase the production of osteoblasts-the cells that actually build bone matrix.

Dr. David Slovik, an Endocrinologist at Harvard-affiliated Massachusetts General Hospital, stated that the rates of hip fractures in the U.S. declined mainly in part to the use of bisphosphonate medication and earlier screenings (Balaji, 2016). Yu et. al. (2019) examined the mortality rates after anti-osteoporosis medication adherence in adults at year one, three, and five post hip fracture. This was a population-based cohort study of over 5,000 participants in which one half were treated with medications and the other group were not treated. Results from the study concluded that survival rates were significantly higher in the "good adherence" group when compared to those in the non-adherence group ($p < 0.0001$). The mortality rates at year one, three and five were 8.6%, 23.7%, and 32.2% for the treated group as compared to 11.8%, 27.8%, and 39.0%. in the non-treated group (Xu, Lombardi, Jiao, & Banfi, 2016). The most

frequently prescribed medications in this study was Alendronate (57.5%), Raloxifene (19.8%), followed by Calcitonin (17.8%).

A first fragility fracture is a strong predictor of a post-secondary fracture (Gillespie & Morin, 2016). Data collected in the FREEDOM trial showed treatment gaps in clinical practice to prevent secondary fractures (Palacios et al., 2015). In this study, data from the U.S. showed only 7-19% of patients were treated with an AOM after a first fragility fracture and similar under-treatment globally. In the FREEDOM trial, patients given Denosumab (monoclonal antibody medication) lowered the risk for secondary fragility fractures by 39% in all risk subgroups independent of age. Several AOMs can be given to patients with low bone mass (osteopenia) with repeat DXA in 2-5 years dependent upon risk factors.

Several studies indicate that even after osteoporosis is diagnosed, there is impediment to treatment (Golob & Laya, 2016 and Mendis et al., 2017). In the Mendis et al. study (2017) 87 patients, ages 55 years and older, were followed up by their provider after a low trauma fracture. Results from his observational retrospective study indicated 63% were not sent for bone density testing, vitamin D levels were not checked in 41%, and no pharmacologic therapy started in over 63% of the patients. Barriers to treatment include lack of knowledge, lack of awareness (multi-provider), lack of owning the responsibility for treatment, cost of therapy/medication, low rates of referral to specialists for osteoporosis management, and medical comorbidities.

The current recommended guidelines when using AOMs is to treat for five years followed by full re-evaluation with a physical examination and repeat BMD (Golob & Laya, 2015). At that time, if no new high-risk factors have come into play, the patient can be monitored closely. All patients are encouraged to get adequate sources of calcium as well as vitamin D in their diet. The Institute of Medicine as well as the National Osteoporosis Foundation

recommends 1,200mg of calcium daily for women 51 years and older and 700-1,000mg of vitamin D daily dependent upon age. The National Osteoporosis Foundation recommends bone density testing every 3-5 years after medication onset as well as possible bone turnover biochemical markers (National Osteoporosis Foundation, n.d.).

Prevention

Literature is consistent that there is under screening for osteoporosis, lack of consistency in screenings, and lack of treatment initiation. The primary goal is the prevention of osteoporotic fractures throughout a lifetime with special attention to any female, regardless of age, who may have risk factors that pose a threat to optimal bone health. Prevention includes risk assessment screenings, bone density screenings, adequate exercise, a diet rich in calcium and vitamin D, as well as lowering a modifiable risk that may impede strong bone matrix.

Prevention can begin as early as age 30 when bone density starts to decline slowly. Daroszewska (2015) stated that a healthy lifestyle, daily physical activity, and a diet high in soluble fiber increase intestinal absorption of calcium thereby increasing bone mineral density. In a randomized clinical trial with over 3,000 healthy, ambulatory females, those who were given a treatment of 800 international units (IU) of Vitamin D daily showed a 32% reduction in overall fractures and a 43% decrease in hip fractures (Daroszewska, 2015). Tan, LaMontagne, English, and Howard (2016) did a cluster-randomized trial which compared workplace groups that were placed either in a control group or the intervention group. The intervention group received three osteoporosis prevention workshops. Comparisons were made six months after the intervention which showed the work-intervention group had improved calcium daily intake and increased load/weight bearing physical activity ($p < .0005$) when compared to the control group.

It is estimated that as much as 23% of osteoporosis is due to lack of physical activity (Tan et al., 2016).

Theoretical Model

The model used for this project is the RE-AIM Framework developed by Russ Glasgow, Shawn Boles, and Tom Vogt in 1999 (Gaglio, Shoup, & Glasgow, 2013). The Reach, Effectiveness, Approach, Implementation, and Maintenance model grew from the need to establish validity of the implementation of healthcare promotion and the need to report key findings. It was originally created to assess the dissemination of clinical healthcare practice changes and widely used today by many key stakeholders and organizations. RE-AIM (Figure 1) follows a logical sequence from thought to adaptation and implantation of research to allow for more effective evaluation and reporting of initiatives.

The Reach in RE-AIM is the targeted audience and represented those individuals who would like to participate in a new initiative. The APRNs in this project were the population that had been chosen as they expressed interest and need to learn about osteoporosis screening. The project plans to reach the members of the Cobb/Cherokee APRNs who were actively seeing female patients, who ranged at least from 45-64 years of age, in their practice setting. The Effectiveness in RE-AIM is the impact that an intervention or initiative had on an outcome-positive or negative. The intention for this project was the APRN's would embrace an evidence-based and validated tool to screen for low bone mass after presentation by the PI. The implementation of the SCORE tool into APRN practice was measured post project. The Adoption section of RE-AIM focused on the representativeness of a group or setting who were willing to initiate a program. The APRNs who screened using the SCORE tool were encouraged to adopt the tool into practice. The Implementation of RE-AIM referred to the target groups

faithfulness to all elements of an initiative or intervention protocol. The APRNs were asked to use the SCORE screening tool for a total of four weeks. The Maintenance portion of RE-AIM was the extent to which an organization validated and institutionalized the said intervention or imitative as part of practice. The goal of the project was to arm APRNs with additional tools to prescreen females for low bone mass and capture those at risk by implementing the SCORE tool into everyday practice.

Figure 1

REAIM Framework

Note. This figure demonstrates the REAIM Framework. Reach your intended target population-Efficacy or effectiveness- Adoption by target staff, settings, or institutions-Implementation consistency, costs and adaptations made during delivery-Maintenance of intervention effects in individuals and settings over time (Gaglio et al., 2013).

Methodology

The project used an evidence-based study design to incorporate clinical expertise and the best scientific evidence to impact osteoporosis screening patterns in APRNs to identify women at risk for low bone mass. The overall purpose of this project was to increase knowledge of APRNs

that low bone mass and osteoporosis can be suspected at ages less than 65 using the SCORE tool. A comprehensive educational osteoporosis workshop was given to interested APRNs bringing awareness of the need to screen females ages 45-64. The project consisted of a planning phase, project implementation phase, and post workshop analysis phase. After post implementation of the project, a descriptive analysis was completed to identify if APRNs were able to implement the SCORE tool into practice and identify any barriers that prevented them from doing so.

Setting

The project took place at the healthcare setting where the APRN participants were employed. These areas included APRNs working in Primary Care/Internal Medicine, Women's Health, Rural Health, or Health department. If the participant was not employed in one of these places, they could be employed in a different area so long as they fulfilled the requirement of seeing female patients 45-64 years of age. The participants could be part time, full time, or per diem and used the screening tool SCORE on female patients ages 45-64. The educational workshop was held at a local senior assisted living center for the Cobb/Cherokee UAPRN chapter members that expressed interest in attending. The setting included seating, an audio-visual media center, and access to break rooms.

Study Population

The study participants consisted of APRNs (Cobb/Cherokee chapter) of the nursing organization United Advanced Practice Registered Nurses of Georgia. Participants who attended the workshop were asked to volunteer for this project if they met the inclusion criteria. All consent forms and instructions for the participants were given at the workshop. The attendees at the workshop were encouraged to complete the workshop even if they had no plans to participate in the project. Inclusion criteria included being a member of UAPRN, holding an active APRN

license without restriction in the state of Georgia, and current employment in Primary Care, Internal Medicine, Women's Health, or Rural/County Health. The exclusion criteria included APRNSs who did not meet the previous stated criteria or presently using the SCORE tool in practice regularly.

Project Interventions

The planning phase of this project included an educational osteoporosis workshop that preceded the start of the project phase. Upon arrival, participants checked in at the registration table, signed a consent form after explanation of the project by the PI (Appendix B), confirmed a current email address and created a personal identifier number (ID) (the first letter of their first, middle, and last name, and the year of birth). After participants checked in and were seated, the PI handed out and explained the Practice Demographic Characteristic Survey (Appendix C) and Evidence Based Practice Questionnaire (EBPQ) (Appendix D). Each participant was given instructions to place their created ID number on the top of the forms. The PI collected all forms and placed them in a sealed envelope along with the master list of the ID numbers and email addresses. Those participants who chose not to participate in the project were allowed to attend the osteoporosis workshop. A one-hour osteoporosis presentation was given by the PI covering osteoporosis, bone formation and resorption, risk factors, screenings, current guideline recommendations, and impact on healthcare. During the osteoporosis workshop, the PI introduced the risk assessment tool called the Simple Calculated Osteoporosis Risk Estimator (SCORE) to be used during this project. Instructions on the use of the SCORE tool were given during the presentation. After completion of the workshop all attendees were asked to complete an evaluation of the workshop (Appendix E). The workshop evaluation summary was formatted using a Likert scale. It was created by the PI to determine the impact of the workshop on

attendees (even if they did not volunteer for the project) in the ability to comprehend the impact of osteoporosis on females, the need for screening, and ability to use the SCORE tool.

Interested APRNs who expressed desire to participate in the project were encouraged to implement the use of the SCORE tool into their practice for the next four weeks to their female patients between the ages of 45-64. The PI sent a weekly email reminding the participants to use the SCORE tool in practice for the next four weeks. After completion of the four-week timeframe for implementing the SCORE instrument, the participants were sent a link to complete a Post Project Implementation survey (PPIS) via Qualtrics (Appendix F). The participants were asked to enter their ID number that was chosen at the start of the project and include it on the survey. The PPIS identified whether the APRN was able to implement the SCORE tool into practice. If the participant was unable to implement the tool into practice they were given a checklist to identify barriers to implementation of the SCORE tool.

Outcome Measures

Several validated tools were used for this project after a complete and comprehensive review. At the workshop, each subject was given the Evidence Based Practice Questionnaire (EBPQ) to determine their current practice patterns regarding knowledge, attitudes, and use of evidence-based practice in their current healthcare setting. The EBPQ was developed by Professor Dominic and Dr. Penney Upton (Upton & Upton, 2006) with the sole purpose to gather information from healthcare professionals on their attitudes and knowledge regarding evidence-based practice. The instrument focused on three main areas: attitudes, knowledge, and use of evidenced based practice. It was a 24-item questionnaire with a seven-point (1 = never and 7 = frequently) Likert rating scale. It's ease of use and straight forwardness made it a desirable instrument to use across the various educational levels of those taking the tool. The Cronbach's

alpha scores ranged from 0.70 to 0.93 (a > 0.7 to 0.93). The Practice Demographic Characteristics survey was an instrument created by the PI and was used to assess demographic and practice setting specifics of each participant. All participants who attended the workshop were asked to complete the survey. It consisted of eight questions with multiple choice answers. The Simple Calculated Risk Estimation score instrument (SCORE) (University of Washington-Osteo ED, n.d.), is a non-invasive and non-radiologic risk assessment tool that can play a key role in identifying women less than 65 years of age at risk for osteoporosis and potential future fractures (Pecina, Romanovsky, Merry, Kennel, & Thacher, 2016). The participants were asked to implement the SCORE tool into practice for four weeks. The participating APRNs were then emailed the Post Project Implementation Survey (PPIS) after completion of the four-week SCORE tool use which will specifically measure any work/environmental factors associated with the implementation of the SCORE tool into practice as well as any perceived barriers that prevents implementation of the SCORE tool into practice. The survey was created by the PI and consisted of two questions to be answered by the participants one week after completion of the project.

Benefits/Risks

The goal of this project was to increase screening patterns of the APRNs. There was negligible physical harm in attending a workshop and implementing evidence-based practice. The risk for the APRN was not identifying those women at risk. As with any radiologic x-ray,-a participant could be exposed to a small amount of radiation if the provider deemed they need to have a DXA scan due to their SCORE evaluation. The decision to have the DXA scan done was solely the decision of each patient. There could be slight stress or psychological harm should a patient score as high-risk and the DXA scan order be placed or discussed with the patient. There

was minimal risk for any undue physical or psychological harm, stress, or legal complications for the APRN's participating in the project. Use of the SCORE tool could extend the patient visit by an additional 5-7 minutes. The participant may elect to opt out of the project at any time without any questions or explanations asking about their decision.

Subject Recruitment

Recruitment for this project used the convenience sampling method of the Cobb/Cherokee UAPRN chapter members of United Advanced Practice Registered Nurses (UAPRN). The PI sent an email to the county chapter members inviting them to an osteoporosis workshop and recruited members to participate in the DNP project at the conclusion of the workshop. The email was sent four weeks before the workshop start date. Interested APRNs were able to click on the link in the email and confirm their plans to attend. A confirmation email was then sent to those APRNs who wished to attend the workshop given by the PI with a reminder email one week prior to the workshop. The acceptance to participate in this project was voluntary and subjects could opt out or discontinue participation at any time. APRNs could still attend the workshop should they choose not to participate in the project.

Consent Procedures

After completion of the osteoporosis workshop, the PI asked for volunteers to participate in the project. The APRNs who expressed a desire to participate were given an informed consent. They were asked to fully complete it after careful review. Any questions the participants had were answered by the PI. The consent form addressed each area of the project. The PI provided and collected the signed consent forms at the workshop and placed them in a sealed, private envelope for safety and security measures. The PI explained to all APRNs participating that no coercion or undue influence would be used during this project and that they may opt out of the

project with no penalty. Minors were not involved in this project as the participants were 21 years of age or older. IRB approval was received by the respective entities prior to the start of the project (IRB Approval).

Subject Costs and Compensation

The study participants were not expected to incur any out of pocket financial costs other than local travel mileage to the workshop. The educational workshop for the Cobb/Cherokee chapter members was promoted to all active chapter members and participation in the project was not a requirement to attend. All workshop attendees were provided a complimentary meal by the PI at no additional charge. There was no other project compensation awarded to the study participants. The dinner workshop presentation lasted approximately 1.5 hours and the attendees were invited to stay an additional 15 minutes if they chose to be included in the project. The incentive for participation in the project was the valuable education the APRNs received in attending a free educational workshop on osteoporosis and its detection, as well as implementing evidence-based practice into their workplace. APRNs who attended the workshop each received a one hour continuing education unit approved by the American Academy of Nurse Practitioners (Appendix G) after completion of a post-workshop survey created by the PI (Appendix E).

A weekly project reminder email and one post project survey was sent to each participant using their home email. The use of personal emails was used to avoid employee restrictions of personal email use while at work. Time commitment by the subject participants was minimal by only reading a short weekly email and answering several questions on the post project survey.

Project Timeline

A detailed timeline for the project can be found in Appendix G. The implementation of the project started with the educational workshop in September 2019. Participants in the project

were asked to use the SCORE tool for a total of four weeks on a regular basis. One week after completion of the four-week SCORE tool use, the PPIS was sent to each participant to complete. The project's completion date, to include all analysis and interpretation, was completed in January 2020.

Resources Needed/Economic Considerations

There were minimal financial costs encumbered by the PI associated with the planning and implementation of this project. A local West Cobb-Marietta, GA senior living center offered the use of their facility to host the osteoporosis workshop free of charge. The venue had ample parking and no financial obligations for use was noted. No other charges were associated with its use for the project. The center provided a large room to seat all workshop attendees, a kitchen for meal service, restrooms, and necessary media equipment for the workshop presentation. Other major resources included administrative items such as meals costs of the attendees, paper, printed workshop handouts, and mileage associated with travel to and from the workshop. The so noted financial costs were paid by the PI. The UAPRN Cobb-Cherokee chapter allowed free web/email use of its site to deliver the invite to paid members for the project. Members of the Cobb/Cherokee members pay a yearly membership fee of $100 to stay active within the chapter to receive emails and invites to workshops and dinner programs. The post project implementation survey was delivered through the online Qualtrics website at no charge to the PI.

The creation of the CE unit by the PI followed all AANP guidelines and there was an additional cost by the PI to meet these guidelines and the use of the AANP logo on the CE. All expenses incurred were paid by the PI.

The results of the project were formulated into a poster which was created by the PI and presented at the Atlanta Unity Conference in October 2019. Costs associated with the poster

presentation included printing of poster, conference fees, travel to and from the conference, hotels fees and charges, and meals. All costs were the sole responsibility of the PI.

Evaluation Plan

Data Maintenance/Security

All participants' privacy was maintained throughout the project. Each NP created an identifier number to use when reporting their results and no names or other identifying information was released to the PI during this project. All forms were collected at the workshop and stored by the PI in the PI's locked desk in a locked personal office. The surveys completed via Qualtrics were stored on the PI's computer for this project and was password specific and locked. No audio or video recordings were used. Data was entered weekly into the PI personal computer using IBM Statistics 25 SPSS and stored securely. All records, data, and identifiers will be stored for three years per GCSU policy and then destroyed. No future risk of harm to participants is foreseen.

Data Collection

There were four tools that the PI collected and interpreted for data analysis. The tools were completed by participants who attended the workshop and those who proceeded in the project. The first tool to be completed was the Practice Demographic Characteristic Survey (Appendix C). The demographics survey was created by the PI and addressed areas such as place of APRN employment, prior use of SCORE tool, description of practice setting, years of APRN experience, and number of providers in the practice. The second tool was the EBPQ questionnaire (Appendix D). It was developed by Upton and Dominick in 2006 (Upton & Upton, 2006) to collect data and opinions from healthcare professionals on their use of evidence-based practice. Answers to the questionnaire are in scale format with 1 = never, 2 = occasionally, 3 =

usually, and 4 = always. An explanation was given to the participants of no right or wrong answers and they were to answer with honest recollection as to how they currently practice. The first section addressed their practice in relation to individual care-how often had they done the following in a response to a gap in their knowledge. The second section of the EBPQ asked attendees to self-reflect and rate themselves concerning evidence-based practice, time constraints, and practice changes (Table 3). The final section addresses self-reporting of research and informational technology skills. The third tool was the Post Project Implementation Survey which addressed if the participants were able to implement the evidenced-based SCORE tool into their practice setting. The fourth tool was the workshop evaluation form created by the PI and completed by all participants upon conclusion of the presentation (Appendix E).

The attendees were asked to complete both the demographics survey and the EBPQ prior to the presentation of the workshop. The PI answered any questions if they arose. The PI collected the completed surveys and placed them in a sealed envelope. After the four-week project timeframe, the participants were emailed the Post Project Implementation Survey (Appendix F) to complete. The PPIS was emailed to their home email as stated in the consent. There were 11 participants who completed the PPIS.

Data Analysis

Demographic Description

There were 24 attendees at the workshop, and 45.8% (n = 11) agreed to continue as participants in the project (Table 1.). After the one-hour presentation, the attendees were asked to complete a written workshop evaluation (Appendix E). The workshop evaluation numbers ranged from 1 = strongly disagree, 2 = somewhat disagree, 3 = agree, and 4 = strongly agree to be answered honestly after the presentation. The attendees felt the workshop was a valuable

experience and gained insight and knowledge on the impact of osteoporosis. The evaluations disclosed that 100% *(n* = 24) of the attendees were now better able to: (1) learn the devastating impact of osteoporosis on females (2) identify younger females at risk for low bone mass and (3) over 83% could utilize the SCORE tool to help screen younger female patients.

Demographic data analysis was completed using SPSS IBM 25 software. The missing data from the EBPQ was assigned the number 99 and entered into SPSS. The majority of the participants (54.5%) worked in settings other than Primary Care or Internal Medicine, and most (90.9%) classified their place of employment as urban. The average number of years of advanced practice nursing was 11.6 years and ranged from 1.5 years to 43 years. Most participants worked with other MD's at their place of employment (75%) with a total of 1-5 APRN's (75%).

Table 1. Demographics of APRNS's

Variables	*N*	Percentage
Place of employment		
Primary Care/Internal Medicine	4	36.4%
Women's Health	1	9.1%
Health Dept.	0	0.0 %
Other	6	54.5%
Employment setting		
Rural	10	90.9%
Urban	1	9.1%
Years of Advanced Nursing practice		
0-5	4	36.4%
6-10	1	9.1%
11-20	4	36.4%
20+	2	18.2%
Providers in the practice setting		
MD		
0	2	18.2%

1-5	3	27.3%
6-10	2	18.2%
10+	1	9.1%
(missing entry)	3	27.3%
APRN		
1-5	6	54.5%
6-10	1	9.1%
10+	1	9.1%
(missing entry)	3	27.3%
Other Provider		
0	4	36.4%
1-5	3	27.3%
6-10	1	9.1%
10+	0	0.0%
(missing entry)	3	27.3%
Practice setting		
Hospital	6	54.5%
Private practice	4	36.4%
Health dept	0	0.0%
Other	1	9.1%

Findings of Research Questions

Research Question 1: Will APRN's who attend an osteoporosis risk assessment program implement the SCORE tool into practice?

Findings revealed that 90.9% of the participants (n = 10) planned to continue incorporating the SCORE tool into practice with the intention of using it as a pre-screening instrument. One participant indicated that the SCORE tool would not be continued to be used, which was identified on the PPIS. Prior to the osteoporosis workshop, 63.6% of the participants reported they had no prior use of the SCORE tool. After the projects' completion, 91% of the participants planned to continue using the SCORE instrument as a means to capture those women (ages 45-64) who might be at risk for low bone mass (Table 4). The participants who

attended the workshop stated they gained valuable evidence-based information and saw a definite need to prescreen younger female patients. The increase in pre-screening females will enable providers to initiate low bone mass education and/or medication regimens sooner. Patients will gain valuable instruction by the APRN on ways to increase protection of bone mass if screened earlier.

Research Question #2: Will the EBPQ tool identify APRN's who will implement change into practice?

Eighty-three percent of the participants rated themselves as either "always seeing evidence-based research as fundamental to their practice" (n = 7) or "usually seeing evidence-based research as fundamental to their practice" (n = 2) out of the total 11 APRN project participants (Table 3). The remaining two participants rated themselves as "never seeing evidence-based research as fundamental to their practice" (18%). Results concluded that the APRNs (n = 7) who rated themselves as "always seeing new evidence as fundamental to professional practice" were more likely to implement change (planned to continue to use the SCORE tool) than those who rated themselves as "usually seeing new evidence as fundamental to professional practice" (n = 2). Of the two participants who "usually" saw new evidence as fundamental to practice, one did not plan to implement change into practice and did not state a specific reason.

The results reveal that APRNs embrace evidence-based knowledge and research when incorporating it into their practice settings. APRNs are educated while held to the highest standards and expected to implement new data and information in keeping with the best interest of the patient. The APRNs who see new evidence as fundamental to practice will promote health and awareness to their patients as new data and research becomes available. APRNs are required

to continue to learn and keep abreast of new healthcare guidelines as they become available. Many patients prefer to have an APRN as their sole healthcare provider due to the diligent effort APRNs pour into their patients' health promotion.

Research Question #3: What work/environmental factors are associated with the implementation of the SCORE tool into practice?

Over 91% of the participants that planned to continue to implement the SCORE tool into practice were classified as working in either a hospital or private practice setting (n = 10). The work and environmental factors associated with implementation of the SCORE tool into practice disclosed both rural and urban APRNs planned to continue use of the SCORE tool (Table 4). One participant classified her employment setting as urban and was unable to continue its use for other reasons, as indicated on the PPIS. APRNs are a valuable key stakeholder when educating their patients.

The results indicate that rural patients who have little or no access to radiologic DXA imaging can be pre-screened with a valid evidence-base tool to identify their risk for low bone mass. Both rural and urban APRNs can educate their female patients on ways to promote optimal bone mass and prevent further breakdown of skeletal mass. Baseline SCORE results can be tabulated and entered into the EMR and repeated as needed. The APRN can tract any changes over the years and proceed to order radiologic imaging if needed while protecting the patient from unnecessary radiation exposure.

Research Question #4: What are the perceived barriers that prevent implementation of the SCORE tool into practice?

Over 90% of the APRNs employed in Primary Care, Internal Medicine, Women's Health, Health Department, or Other were able to use the SCORE tool and planned to

incorporate it into their practice (n = 10). There was one participant who did have a barrier that prevented the use of the SCORE tool after completion of the project. The participant listed the barrier as "other reason" on the PPIS for explanation as to the barrier. No further information was given on the barrier by the participant. This participant did rate as "usually seeing new evidence as fundamental to professional practice." The participant did not state if they were able to fully use the SCORE tool for the entire four weeks but did answer the PPIS that was emailed upon conclusion of the project.

The results indicate there are minimal barriers for APRNs to implement the SCORE tool into practice. This will assist many healthcare providers in their decision making with regards to earlier screenings.

Further Findings

The attendees evaluated the workshop as proven to be successful in identifying women whom they should screen and gained valuable education on use of the SCORE tool. Regarding the EBPQ, there were six questions in the first section that the participants were asked to complete (Table 2). Six participants (54.5%) articulated they framed an answerable question at the beginning of patient care to fill in knowledge gaps regarding their practice. After known gaps were identified, over 90% of the attendees stated they tracked down pertinent evidence once the question was identified and critically reviewed the literature for set criteria. Over 90% stated they integrated newly found evidence into their practice once identified, and 72.% shared this information with peers/colleagues. After researching and filling knowledge gaps, 72.8% (n = 8) stated they evaluated the outcomes of their practice changes.

In the second set of questions of the EBPQ (Table 2), the first question addressed allotting time to incorporate new evidence into practice. Findings indicated 72.7% (n = 8) did

make time in their schedules. Only 9% (*n* = 1) stated they never made time for new evidence regarding their work schedules. Over 90% (*n* = 9) welcomed questions about their clinical practice patterns. Results showed that 81.5% usually or always deemed evidence-based practice as fundamental to their practice, with 54.5% (*n* = 6) claiming that their practice has changed because of new evidence they have found and incorporated. Only one participant stated their practice had not changed because of new evidence being found. There was no further information given to the PI regarding why they chose or were unable to continue to use the SCORE tool.

Table 2. Evidence-Based Practice Questionnaire (EBPQ)

Questions	Never n (%)	Occasionally n (%)	Usually n (%)	Always n (%)
Considering your practice in relation to an individual patient's care over the past year how often have you done the following in response to a gap in your knowledge				
Formulated a clearly answerable question as the beginning of the process towards filling this gap:	1 (9.1%)	2 (18.2%)	6 (54.5%)	2 (18.2%)
Tracked down the relevant evidence once you have formulated the question:	0 (0%)	1 (9.1)	8 (72.7%)	2 (18.2%)
Critically appraised, against set criteria, any literature you have discovered:	0 (0%)	1 (9.1%)	8 (72.7)	2 (18.2)
Integrated the evidence you have found with your expertise:	0 (0%)	1 (9.1%)	7 (63.6%)	3 (27.35)
Evaluated the outcomes of your practice:	0 (0%)	3 (27.3%)	5 (45.5%)	3 (27.3%)

Shared the information with colleagues:	0 (0)%)	3 (27.2%)	5 (45.5%)	3 (27.3%)

Table 3. Evidence-Based Practice Questionnaire (EBPQ)

Questions	Never n (%)	Occasionally n (%)	Usually n (%)	Always n (%)
Please indicate how you would place yourself for each of the following questions.				
I make time for new evidence in my work schedule:	1 (9.1%)	2 (18.2%)	6 (54.5%)	2 (18.2%)
I welcome questions regarding my clinical practice:	1 (9.1%)	1 (9.1%)	4 (36.4%)	5 (54.5%)
Evidence-based medicine is fundamental to professional practice:	2 (18.2%)	0 (0%)	2 (18.2%)	7 (63.3%)
My practice has changed because of evidence I have found:	1 (9.1%)	1 (9.1%)	3 (27.3%)	6 (54.5%)

The project participants scored themselves on their prior use of the SCORE tool before the project and after project implementation (Table 4.). Prior to the workshop, 63.6% (*n* = 7) of the participants indicated they had not previously used the SCORE tool. Only 36.4% (*n* = 4) had previously used it within the last month on their female patients.

Table 4. (n = 11)

SCORE tool use prior to workshop

	Frequency (n)	Percent (%)
0 times	7	63.6%
1-5 times	4	36.4%
Total	11	100%

SCORE tool use after project

	Frequency (n)	Percent (%)
No-will not use	1	9.1%
Yes-will use	10	91.9%
Total	11	100%

Recommendation and Discussion

The USPSTF guidelines and recommendations regarding screenings for osteoporosis prove valid and necessary. However, literature is consistent that many younger females are at risk for low bone density, and healthcare providers are missing opportunities to screen before age 65. The potential to decrease future fragility fractures is overwhelmingly necessary and imminent (Golob & Laya, 2015). The PI recommends that APRNs continue to use the SCORE tool for screening younger female patients. The project highlighted the inconsistencies of screenings and the need for more global awareness of this overwhelming problem. Education for healthcare providers is imperative to incorporate evidence-based research into practice. The PI found valuable awareness and current preventative screening information from the USPSTF website.

Economic/Cost Benefit

The goal of osteoporosis screening is to identify women with lower T-scores (<2.5) so that appropriate therapy can be initiated and the prevention and/or reduction of potential

fractures. Data shows that 50% of postmenopausal females will experience an osteoporotic fracture in her lifetime, and over 200 million women worldwide will be affected by osteoporosis (Daroszewska, 2015). Although to date there are valid risk assessment tools and radiologic imaging tests available to identify risk for osteoporosis or confirm diagnosis thereof, Gillespie and Morin (2017) state screening among women ages 50-64 has declined steadily from 2008-2014. Osteoporotic related fractures in the U.S. cost approximately $17 billion annually and are expected to continue to rise as our population ages (Gold et al., 2019). It is estimated that osteoporotic fractures lead to more than 500,00 hospital admissions annually and account for greater than 800,000 hospital emergency room visits (Gold et al., 2019). The effect and costs associated with osteoporosis are also impacted by the burden of non-direct medical costs such as pain, depression, and poor health. Many women are left to reside in assisted rehabilitation facilities and suffer from chronic pain and altered function of life. For many patients, the quality of life is severely impacted, leading to social isolation and mental health challenges. The benefit of identifying women at risk for low bone mass can prevent future fractures and possibly mortality. Literature is consistent, stating that morbidity and mortality rates are high post-fracture, with 20%-25% of hip fracture patients dying after the first year (Tsai, 2019).

Pharmacological and nonpharmacological interventions are available to increase bone density to prevent further bone loss. The SCORE risk assessment tool has a high sensitivity in predicting those females with low bone density and providing healthcare providers an extra tool to assist with decisions in treatment and further testing. APRNs are in an excellent position to teach and educate their patients.

Impact on Healthcare Quality and Safety

The screening and diagnosis of osteoporosis do not lie in the hands of any one particular healthcare member. The confusion often evolves when patients see varying specialists and healthcare team members for treatment and observation. Providers might assume a specialist is providing the screening when, in reality, no screening has been attempted. The SCORE risk assessment tool is validated as a safe, nonradiologic instrument that helps identify women at risk for low bone mass. It does not replace the DXA scan-but optimally excludes patients who should or should not have radiologic imaging. The tool itself takes no longer than one to two minutes to implement with immediate results viewable. Several websites that provide free online access to the SCORE tool with results. There is no training necessary for implementing the SCORE tool. The results of each person's SCORE outcomes identify them at either low, moderate, or high risk for low bone mass with 92-95% sensitivity (Pecina, Romanovsky, Merry, Kennel, & Thacher, 2016). Reduction in preventable fragility fractures is a necessary healthcare quality control outcome.

Policy Implications

Pecina et al. (2016) state that the SCORE tool had a statistically higher sensitivity threshold in detecting osteoporosis in women ages 50-64 than the current USPSTF guidelines using FRAX threshold of 9.3%. The SCORE tool, if implemented into a hospital or practice-based setting, could be used as a first-line risk assessment screening instrument for younger female patients. EMR's have important screening instruments embedded within the chart. Educating healthcare personnel to utilize the SCORE tool would help in the decision-making process of when to start or refer for radiologic DXA screening if low bone mass is suspected.

The providers would still fully appreciate the USPSTF's guidelines for initial DXA screening at age 65 without any disruption in national recommendations or policy.

Translation

The response upon conclusion of the workshop was positive and beneficial. Attendees asked numerous questions and expressed sincere gratitude for the newly learned content and value of capturing low bone mass early. There were numerous attendees who expressed interest in learning more about the SCORE tool and planned to share this information with coworkers and peers. Numerous attendees who did not meet inclusion criteria for participation also found value in attending the workshop and use of the SCORE tool.

Pre-screening tools have proven to be a valid and necessary instrument that will help the APRN in decision-making strategies with regards to DXA imaging. The majority of the attendees at the workshop planned to make changes within their own practice and lifestyles to reduce the possibility of low bone mass and fragility fractures. APRNs have a prominent place in both the healthcare and academic setting. The gainful information learned in this project can be shared with colleagues and peers.

Limitations

There were several limitations the PI concurred during the implementation of this project. The primary limitation was the small sample size of participants. The objective was to have at least thirty participants volunteer for the project. The PI assumes that the small sample size was due to the workshop held at a location the Cobb/Cherokee chapter typically does not use for presentation. However, the venue chosen was appreciated by those who attended. Several student Cobb/Cherokee chapter members who attended the workshop were enthusiastic to start using the SCORE tool. However, they did not meet the inclusion criteria to be part of the project. A

limitation was a small amount of missing data information from several participants on the EBPQ. At the beginning of the workshop, all attendees were asked to complete the EBPQ completely; however, three attendees missed several areas for completion. Any missing data was handled by assigning the number 99 and entered into SPSS. The majority of all data was captured and entered into the specific variable categories.

Discussion

The awareness to implement this project started after the PI witnessed discrepancies in practice patterns of APRNs in screening for osteoporosis in their places of employment. After discussion with numerous APRNs regarding their initiation of screening for younger women, the PI saw the need for this evidence-based project. Many of the APRNs who were questioned about their screening patterns stated they used the FRAX tool for their older patients but lacked knowledge on screenings with other evidence-based non-radiologic tools. The PI did not find any other completed DNP or other research projects addressing the use of non-radiologic screening tools for younger female patients at risk for low bone mass in numerous repositories.

The PI was able to interview the APRNs who attended the osteoporosis workshop after its completion. The discussion regarding the workshop was overwhelmingly positive and appreciated by all who attended. Many of the APRNs voiced sincere appreciation for the new material learned as they had not recognized the devastating impact of osteoporotic fractures and their need to address earlier screenings for younger female patients. This evidence-based project was different from others in the respect that it provided the background of an economic and burdensome disease (osteoporosis) and followed with a valid screening instrument that can be used by any healthcare member if applied. The PI was also able to assess the APRNs self-rated scores on the EBPQ and input that data into the final results of this project.

The PI carefully examined the literature for project needs and validity. The PI found sufficient need for the project-based upon literature review and APRN feedback. The consensus of the literature on when to screen younger female patients coincided with the APRN's responses on the pre-project survey in which 33% (n = 8) did not know the current screening guidelines. The participants voiced appreciation and confidence in understanding their role as providers to use the SCORE tool as a pre-screening instrument. Those who attended the workshop expressed gratitude in learning of the impact of osteoporosis and screening patients.

Dissemination

After the four-week use of the SCORE tool, the PPIS form was emailed to all participants via Qualtrics platform delivery system. The PI then gathered project data results and input those results into SPSS. The participants were notified of the results of the project in a post-project email. The email included aggregate data regarding evidence-based changes the participants plan to make in using the SCORE tool in their practice setting. No personal information was included in the aggregate data results. Results of the project were shared with the Cobb/Cherokee UAPRN members.

Professional Reporting

The PI submitted a poster abstract to the 2019 Unity Conference committee poster chair. The abstract included the required specifications and met all criteria. The PI was notified three weeks later that the abstract had been accepted by the conference committee. Permission to display the project poster was granted, and the PI was notified via email that the poster could be displayed. The PI completed a two-day project poster presentation at the 2019 Unity Conference held in Atlanta, GA. The PI was available to participants at the Unity Conference for questions or explanations.

Evidence-based practice is ever changing and noted to be one of the most influential factors in the decision-making process. The PI plans to publish the results of the project in one of several nurse practitioner journals. The goal of this project was to improve screening patterns by APRNs of their younger female patients. Results from the project indicated the evidence-based and validated screening tool SCORE could be used as part of the APRNs screening patterns due to the success of the project.

PI Recommendation

The goal of this project was to bring awareness of a need to screen younger females at risk for low bone mass. Research supports the literature findings that osteoporosis screenings in females are inconsistent, and providers lack consistent methodologies in doing them. The inconsistent screenings were noted nationally as well as globally (Gillespie & Morin, 2016). The ultimate result is to capture and pre-screen younger females who might be at risk and prevent future fractures. The evidence is consistent that lifestyle changes, medication, exercise, and dietary supplements can reverse bone loss and increase bone matrix. The recommendation and findings of this project by the PI are to incorporate nonradiologic pre-screening tools into the APRN student curriculum and increase awareness of the devastating impact of osteoporosis. The project workshop increased significant awareness to each individual who attended. The APRNs who proceeded to use the SCORE tool will now be able to accurately identify younger females at risk for low bone mass by using an evidence-based pre-screening tool.

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Figure 1. RE-Aim Model

Appendix A

Simple Calculated Osteoporosis Risk Estimation (SCORE)

Criteria:

A. Race not black:	5 points
B. Rheumatoid Arthritis:	4 points
C. Fracture after age 45 of wrist, hip or rib:	4 points per fracture
D. Age over 65:	Calculate 3 x 1st digit of age (example age 70 = 21points)
E. Weight:	Calculate -1 x weight in pounds/10 (example weight of 200 pounds= -20 points)
F. Estrogen therapy never used:	1 point

_____Total points

SCORE Total:

16-50 Points: High Risk
7-15 Points: Moderate Risk
0-6 Points: Low Risk

Notes:

Interpretation

A. Score of 6 or above is associated with T-Score below -2 (osteopenia/low bone mass)
B. Osteoporosis testing with DEXA Scan is recommended if Score of 6 or above
C. Test Sensitivity: 91%
D. 40%

Appendix B

INFORMED CONSENT

(Osteoporosis Awareness Screening Program)

I, _____, agree to participate in the research {Osteoporosis Program}, which is being conducted by Linda Gay DNP-S, who can be reached at lindalgay@gmail.com/6780-231-5218. I understand that my participation is voluntary; I can withdraw my consent at any time. If I withdraw my consent, my data will not be used as part of the study and will be destroyed.

The following points have been explained to me:

1. The purpose of this study is to identify females (45-64 years of age) who may be at hi-risk or higher than normal risk in developing osteoporosis.
2. The procedures are as follows: you will be asked to:
    a. Attend the Osteoporosis Program
    b. Sign the informed consent
    c. Become familiar with the SCORE risk assessment tool
    d. Offer the SCORE risk assessment tool to your female patients (ages 45-64)
    e. Complete the daily tally forms and place in a locked area
3. Your name will not be connected to your data. Therefore, the information gathered will be confidential. Only the Principal Investigator will have access to the master list of ID numbers and data. Your information will be stored in a locked box and/or a password protected computer in the Principal Investigators locked office at home.
4. You will be asked to sign two identical consent forms. You must return one form to the investigator before the study begins, and you may keep the other consent form for your records.
5. This research project is being conducted because of its potential benefits, either to individuals or to humans in general. The expected benefits of this study include identifying younger women at risk for osteoporosis.
6. You are not likely to experience physical, psychological, social, or legal risks beyond those ordinarily encountered in daily life or during the performance of routine examinations or tests by participating in this study.
7. Your individual responses will be confidential and will not be released in any individually identifiable form without your prior consent unless required by law.
8. The investigator will answer any further questions about the research should you have them now or in the future (see above contact information).
9. In addition to the above, further information, including a full explanation of the purpose of this research, will be provided at the completion of the research project on request.
10. By signing and returning this form, you are acknowledging that you are 18 years of age or older.

Signature of Investigator Date

Signature of Participant Date

Research at Georgia College involving human participants is carried out under the oversight of the Institutional Review Board. Address questions or problems regarding these activities to the GC IRB Chair, email: irb@gcsu.edu.

Appendix C

Practice Demographic Characteristic Survey

Participant ID number:_____
Please answer the following questions (circle your answer).

1-APRN place of employment:

a. Primary Care/Internal Medicine
b. Women's Health
c. Health dept.
d. Other (*please describe)* _____

2-In the past month how often have you used a non-radiologic risk assessment tool to screen for osteoporosis in your pt. population?

a. 0 times
b. 1-5 times
c. 6-10 times
d. >10 times

3-In the past month how often have you used the SCORE osteoporosis risk assessment tool in your patient population?

a. 0 times
b. 1-5 times
c. 6-10 times
d. > 10 times

4-In the past month how often have you ordered a DEXA scan to screen for osteoporosis in your patient population?

a. 0 times
b. 1-5 times
c. 6-10 times
d. > 10 times

5-Your practice setting would be considered:

a. Urban - (urbanized areas of 50,000 or more people or urban clusters of at least 2,500-50,000 people0
b. Rural – (all population, housing, and territory not included within an urban area)

6-Enter number of years of Advanced Nursing Practice:

a. _____

7- How many providers are in your practice?

a. _____# of MD's

b. _____# of APRNs
c. _____ Other

8. How would you describe your practice setting:

a. Hospital practice
b. Private practice
c. Other

Appendix D

Evidence Based Practice Questionnaire (EBPQ).

This questionnaire is designed to gather information and opinions on the use of evidence based practice amongst health professionals. There are no right or wrong answers for we are interested in *your* opinions and *your* own use of evidence in *your* practice.

1. Considering your practice in relation to an individual patient's care over the *past* year, how often have you done the following in response to a gap in your knowledge (please √ or X):

Formulated a clearly answerable question as the beginning of the process towards filling this gap:
Never ☐ ☐ ☐ ☐ ☐ ☐ ☐ **Frequently**

Tracked down the relevant evidence once you have formulated the question:
Never ☐ ☐ ☐ ☐ ☐ ☐ ☐ **Frequently**

Critically appraised, against set criteria, any literature you have discovered:
Never ☐ ☐ ☐ ☐ ☐ ☐ ☐ **Frequently**

Integrated the evidence you have found with your expertise:
Never ☐ ☐ ☐ ☐ ☐ ☐ ☐ **Frequently**

Evaluated the outcomes of your practice:
Never ☐ ☐ ☐ ☐ ☐ ☐ ☐ **Frequently**

Shared this information with colleagues:
Never ☐ ☐ ☐ ☐ ☐ ☐ ☐ **Frequently**

2. Please indicate (by √ or X) where on the scale you would place yourself for each of the following pairs of statements:

My workload is too great for me to keep up to date with all the new evidence	☐ ☐ ☐ ☐ ☐ ☐ ☐	New evidence is so important that I make the time in my work schedule
I resent having my clinical practice questioned	☐ ☐ ☐ ☐ ☐ ☐ ☐	I welcome questions on my practice
Evidence based practice is a waste of time	☐ ☐ ☐ ☐ ☐ ☐ ☐	Evidence based practice is fundamental to professional practice
I stick to tried and trusted methods rather than changing to anything new	☐ ☐ ☐ ☐ ☐ ☐ ☐	My practice has changed because of evidence I have found

3. On a scale of 1 to 7 (with 7 being the best) how would you rate your:

Please circle one number for each statement							
	Poor						**Best**
Research skills	1	2	3	4	5	6	7
IT skills	1	2	3	4	5	6	7
Monitoring and reviewing of practice skills	1	2	3	4	5	6	7
Converting your information needs into a research question	1	2	3	4	5	6	7
Awareness of major information types and sources	1	2	3	4	5	6	7
Ability to identify gaps in your professional practice	1	2	3	4	5	6	7
Knowledge of how to retrieve evidence	1	2	3	4	5	6	7
Ability to analyse critically evidence against set standards	1	2	3	4	5	6	7
Ability to determine how valid (close to the truth) the material is	1	2	3	4	5	6	7
Ability to determine how useful (clinically applicable) the material is	1	2	3	4	5	6	7
Ability to apply information to individual cases	1	2	3	4	5	6	7
Sharing of ideas and information with colleagues	1	2	3	4	5	6	7
Dissemination of new ideas about care to colleagues	1	2	3	4	5	6	7
Ability to review your own practice	1	2	3	4	5	6	7

4. Finally, some information about you:

Your profession:_____ Year qualified:_____

Your position/grade:_____ Your speciality:_____

Please circle the most appropriate answer as it concerns you:

Your sex: Male Female

Your age range: 20-29 30-39 40-49 50-59 60-69

Appendix E

AANP CE Activity Evaluation

Activity Title: Identifying Females at Risk for Osteoporosis and Low Bone Mass Using a Non-Radiologic Screening Tool (SCORE)

Activity ID # 5396033609 **Date:** September 4th, 2019 **Location:** Sterling Estates of West Cobb

Circle the number that best fits your evaluation of this activity:

4=strongly agree 3=agree 2=somewhat disagree 1=strongly disagree

1. As a result of my participation in this activity, I am better able to:
   a. Learn the devastating impact of osteoporosis on females 4 3 2 1
   b. Identify younger females at risk for low bone mass 4 3 2 1
   c. Utilize non-radiologic screening tools to help screen female patients 4 3 2 1

2. The following speaker demonstrated experiential knowledge of the topic.
   a. Linda Gay 4 3 2 1

3. The content provided a fair and balanced coverage of the topic. 4 3 2 1

4. The content was free of commercial bias. 4 3 2 1

5. Would like to receive more CE opportunities for NP's through UAPRN 4 3 2 1

Appendix F

Post Project Implementation Survey (PPIS)

ID Number_____
Please answer the following questions.

1-Was the SCORE tool implemented into your practice setting after attending the evidenced -based osteoporosis workshop?

____Yes
____ No (if no please proceed to question #2)

2-If you did not implement the SCORE tool into your practice setting what barriers prevented you from doing so: *(you may select more than one)*

____ Time constraints
____ Practice policies
____ Alternative screening tools
____ Lack of evidence
____ Lack of support from MD's
____ Lack of support from APRN's
____ Other *(Please answer below)*

Other:

Appendix G

Project Timeline

Action	2019									2020					
	March	April	May	June	July	August	September	October	November	December	January	February	March	April	May
EBP II N3300															
Literature review															
Project Chair appointment															
Project committee selection															
Approval for project development															
EBP III N9300															
Study participant named															
Proposal approved															
Tools identified and created															
Translational and Clinical Research N930															
Osteoporosis invite															
Workshop presentation															
Implementation of SCORE tool															
Gather Data															
Translational and Clinical Research II															
Evaluate project effectiveness															
Complete written proposal/.report															
Project final defense															

Appendix H

Appendix G

August 14, 2019

Linda Gay
147 Threechop Drive
Marietta, GA. 30064

Dear Linda,

The continuing education activity "*Educational workshop: Identifying Females at Risk for Low Bone Mass Using a Non-Radio-logic Screening Tool (SCORE)*", sponsored by Linda Gay, is approved for continuing education by the American Association of Nurse Practitioners. Activity ID number 19073804 has been assigned to this application. All sessions are approved as submitted. This activity has been approved for 1 year (through August 31, 2020), provided no changes are made.

This activity may be repeated 1 additional time within the approval year with appropriate notification per the AANP Accreditation policy.

Use the following statement in your literature to indicate the maximum credit one person can obtain upon completion of this activity: "This activity is approved for 1.5 contact hour(s) of continuing education by the American Association of Nurse Practitioners. Activity ID 19073804. This activity was planned in accordance with AANP Accreditation Standards and Policies."

This approval is for the continuing education activity listed in the original application. With this approval, ALL changes to this program must be reported to the AANP for review as soon as they are identified. This includes, but is not limited to:

- session drops/additions
- speaker changes
- objective changes
- date and /or venue changes

Any changes to content or speakers that are not reviewed by the AANP are not approved for credit.

Refer to this activity's ID number with all communication pertaining to this application including the required post-activity reports. Attendance sheets and evaluation summaries are due to AANP one month after the activity's initial presentation (no later than October 4, 2019). Please find important information and instructions attached regarding mandatory post-activity reporting.

Best Regards,
AANP Accreditation

Appendix I

IRB Approval

Institutional Review Board
Office of Academic Affairs
irb@gcsu.edu
http://www.gcsu.edu/irb
DATE: 2019-07-11

TO: Linda L. Gay
FROM: Sallie Coke, Ph.D., APRN, BC Chair of Georgia College Institutional Review Board
PROJECT TITLE: #11983 Implementation of an osteoporosis workshop for APRN's to identify female patients at risk for low bone mass
ACTION: DETERMINATION OF EXEMPT STATUS
DECISION DATE: 2019-07-11
REVIEW CATEGORY: Exempt

Thank you for submitting an application to the Georgia College IRB for the above-referenced project. Based on the information you provided in your submission, IRB has determined that your project involving human subjects qualifies for EXEMPT status under 45CFR part 46 commonly known as the Revised Common Rule 2018.

Assignment of exempt status to this project means that this project is exempt from further IRB review. This exempt status is valid unless substantive revisions to the study design occur which would alter the risk to participants. If a substantive change is anticipated, you may submit an extension/modification form detailing these changes. Please consult the GC IRB if you have a question about a potential change to your exempt study.

Please note that all responsibilities required of conducting human subject research still apply to this project. Specifically, the Belmont Report principles of respect for persons, beneficence, and justice apply, and all investigators involved in this project must have and maintain current/valid certification of training with conducting research with human subjects

We will retain a copy of this correspondence within our records.

If you have any questions, please contact irb@gcsu.edu. Please include your project title and reference number in all correspondence with this committee.
This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within Georgia College IRB's records.

Sincerely,

Sallie Coke, Ph.D., APRN, BC